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Study of Effects of Channel Stabilization and Navigation Project on Missouri River Levels — Sediment Characteristics of the Missouri River, Sioux City to the Mouth

By Alfred S. Harrison
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THE SEDIMENT CHARACTERISTICS OF THE MISSOURI RIVER - SIOUX CITY TO THE MOUTH

I. INTRODUCTION

1. The purpose of this memorandum is to describe and discuss those sediment characteristics of the Missouri River which will contribute to understanding the behavior of the Missouri as an alluvial stream. The alluvial nature of the river is naturally an important factor in a study of its capacity to carry water at various stages. A description of the river and its sediment load will be followed by discussion of the natural alluvial processes which bring about the variability of rating curves and qualitative appraisal of the effect of contracting the river on its discharge capacity.

II. PHYSICAL DESCRIPTION OF THE RIVER

2. General Dimensions and Behavior. An excellent description of the river is contained in Appendix XV to House Document No. 238, 73rd Congress, Second Session, published in 1934. The description which follows is taken mainly from that source with modifications to bring the data up-to-date. From the mouth to Sioux City, 760 miles upstream, the Missouri River channel meanders in an alluvial valley varying in width from 1-½ to 10 miles. Appendix II to the Study of the Effects of the Navigation and Stabilization Project on Missouri River Levels contains a more detailed summary of valley and channel widths along the river. Before construction of the channel stabilization project, the Missouri River channel from Sioux City to the mouth resembled the natural channel as it is today upstream of Sioux City. The river flowed in a wide sandy channel, the width varying considerably from stage to stage and from place to place. At bank-full stage the river was a mile or more wide in some localities, while the bank-full width was less than 1,000 feet in others. In terms of averages, the bank-full width of the natural channel increased from about 2,000 feet at Sioux City to about 3,000 feet in the lower river. Normally the water level is 5 to 10 feet below bank-full stage. At these normal stages, numerous sand bars were exposed causing the flow in many locations to split among two or more waterways with low sand bars in between. The serpentine alignment of the natural channel changed continuously as it meandered back and forth between the relatively hard bluffs within the easy-to-erode alluvial valley fill. The channel was characterized by downstream movement of sand bars, shifting of the bed elevation (particularly in the crossings between bends), the continual building of sand bars on the insides of bends, and the consequent cutting of the banks on the outsides of bends. The simultaneous processes of bar building and bank cutting tended to shift the channel alignment in the direction of the outsides of the bends and, thus, tended to increase the over-all length of the river. Working against